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PATENT ABSTRACTS OF JAPAN

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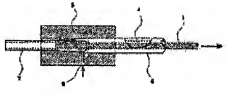
(54) CATHETER TUBE AND ITS PRODUCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent the exposure, etc., of knitting and braiding of metallic wires and the dislodgment of a front end tube consisting of a UV curing resin compsn. having no knitting and braiding and to improve quality and reliability by connecting a torque transmission part provided with the knitting and braiding of the metallic wires between the inner and outer layers consisting of a UV curing resin compsn. and the front end tube on the same axis. SOLUTION: The torque transmission part 6 is constituted by applying the knitting and braiding 4 of the metallic wires on the outer periphery of the inner layer tube consisting of the UV curing resin compsn. and forming the outer layer tube 5 consisting of the UV curing resin compsn. on its outer periphery. The front end tube 7 is formed of the UV curing resin compsn. to the same diameter as the diameter of the inner layer tube 3 without including the knitting and braiding. The torque transmission part 6 and the front end tube 7 are set in a mold 8 and the UV curing resin compsn. is poured into the mold from a resin injecting part 9 and is cured to connect both 6, 7. For example, a urethane acrylate based UV curing resin compsn., etc., are used as the UV curing resin compsn.



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CLAIMS

[Claim(s)]
[Claim 1]An inside diameter with a torque transmission part provided with a braid which consists of metal wires between a inner layer tube and an outer layer tube which consist of an ultraviolet-curing-resin constituent with the above-mentioned inner layer tube and an equal diameter. And a catheter tube which connects an end tube which consists of an ultraviolet-curing-resin constituent which does not have the above-mentioned braid on the same axle with an ultraviolet-curing-resin constituent, and is characterized by things.
[Claim 2]An inside diameter with a torque transmission part provided with a braid which consists of metal wires between a inner layer tube and an outer layer tube which consist of ultraviolet rays and a heat-curing resin composition with the above-mentioned inner layer tube and an equal diameter. And a catheter tube which connects an end tube which consists of ultraviolet rays and a heat-curing resin composition which do not have the above-mentioned braid on the same axle with an ultraviolet-curing-resin constituent, and is characterized by things.
[Claim 3]The catheter tube according to claim 2, wherein a contrast medium is blended into the above-mentioned ultraviolet rays and a heat-curing resin composition.
[Claim 4]The catheter tube according to claim 1 or 2, wherein a heat-curing silicone layer is formed in an inner surface of the above-mentioned inner layer tube and an end tube.
[Claim 5]After applying one or more layers of liquefied ultraviolet-curing-resin constituents on line objects, such as a metal wire, and making this irradiate with and harden ultraviolet rays in a manufacturing method of the catheter tube according to claim 1, give a braid which becomes this periphery from a narrow diameter metal wire, and. After applying a liquefied ultraviolet-curing-resin constituent to the circumference of this braid above further, making this irradiate with and harden ultraviolet rays and forming a torque transmission part, Remove a hardening resin constituent and a braid of a tip part of this torque transmission part, and a line object is exposed, A manufacturing method of a catheter tube characterized by sampling the above-mentioned line object after inserting a flexible end tube object which consists of an ultraviolet-curing-resin constituent in this exposed line object and connecting these torque transmission part and an end tube with an ultraviolet-curing-resin constituent after that.
[Claim 6]In a manufacturing method of the catheter tube according to claim 2, apply liquefied ultraviolet rays and one or more layers of heat-curing resin compositions on line objects, such as a metal wire, and irradiate this with ultraviolet rays, and. After making it heat and harden, give a braid which becomes this periphery from a narrow diameter metal wire, and. After applying a liquefied ultraviolet-curing-resin constituent to the circumference of this braid above further, making this irradiate with and harden ultraviolet rays and forming a torque transmission part, Remove a resin composition and a braid of a tip part of this torque transmission part, and a line object is exposed, A manufacturing method of a catheter tube characterized by sampling the above-mentioned line object after inserting a flexible end tube which consists of ultraviolet rays and a heat-curing resin composition in this exposed line object and connecting these torque transmission part and an end tube object with an ultraviolet-curing-resin constituent after that.
[Claim 7]A manufacturing method of the catheter tube according to claim 6 blending a contrast medium beforehand into the above-mentioned ultraviolet rays and a heat-curing resin

composition.
[Claim 8]A manufacturing method of the catheter tube according to any one of claims 5 to 7 providing a heat-curing silicone layer in the surface of the above-mentioned line object beforehand.
[Claim 9]A manufacturing method of the catheter tube according to any one of claims 5 to 8, wherein sectional shape of the above-mentioned line object is either of the round shape, ellipse form, and glasses types.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a catheter tube used in medical institutions, such as a hospital, and a manufacturing method for the same.
[0002]
[Description of the Prior Art]In order to pour a drug solution and a contrast medium into a patient's predetermined region in the living body from the exterior in medical institutions, such as a hospital, or to discharge body fluid in the living body etc., the tube shape medical device which has the flexibility called a catheter is used, but. Generally, at the time especially of insertion, the high operativity and safety which can reach to a predetermined part in the living body correctly without damaging an intermediate blood vessel wall, a living body organ, etc. are demanded from this catheter being inserted in the living body using a thin blood vessel, an urethra, etc.
[0003]Therefore, this catheter comprises a tip part which was [that it is easy to bend, without damaging a blood vessel and a living body organ] rich in elasticity, and a torque transmission part holding the torque convectivity for making this tip part reach certainly to a predetermined part. And after giving with a braider the braid which becomes a periphery of the tube body (inner layer) which consists of a plasticity plastic which inserted the wire first as the conventional manufacturing method, for example from a corrosion-resistant metal wire, Then, the torque transmission part which passed the metallic mold which heated this tube body, made that braid embed in a tube body, and provided the reinforcement layer in that circumference is formed. Next, after forming the reinforcement layer located in the tip end part of this torque transmission part, i.e., the tip part which removed metal braids by the electrochemical remove-metals method, and was rich in elasticity, Cut the base catheter which carried out package coating of the outer layer for the plasticity plastic by extrusion as well as the periphery of that tube body, and formed the torque transmission part and the tip part by turns so that it may become the length of the actual catheter which consists of one torque transmission part and tip part, so that this reinforcement layer may be covered, and. The method of forming by drawing out from a tube body is known after extending the above-mentioned wire.
[0004]
[Problem(s) to be Solved by the Invention]By the way, in the conventional catheter manufacturing method which was mentioned above. In order to take the outer diameter small a large inside diameter as much as possible, when thickness of a catheter tube is made thin, there is a problem which the metal braids embedded in the inner layer tube expose to the tube inside, or unevenness produces in a tube inner surface.
[0005]In order obtain uniform torque convectivity and to stick a inner layer and an outer layer, a glue line may be provided between them, but when it does so, there is a problem of thickness becoming thick or a work process increasing.
[0006]As mentioned above, in order to make the tip part into structure without a braid (reinforcement layer), remove the braid of a tip part electrochemically, or have connected another tube body in which the braid is not included with melting connection, adhesives, etc. at the tip of a torque transmission part, but. In order to remove a braid, the device and process for

it are needed, manufacturing efficiency is bad and there is inconvenience from which an inside diameter and an outer diameter change in those terminal areas by the method by melt adhesion. By connection by adhesives, it is hard to obtain the stable intensity from adhesion area being small, and the worries about the tip part pasted up during the operation being missing in the living body etc. can be considered. Especially the thing for which it is stabilized and the anxious catheter of such lack which is not is manufactured in connection of different-species plasticity plastics is very difficult.

[0007]Then, this invention is thought out in order to solve such SUBJECT effectively, and it is a thing.

The purpose does not have fear, such as exposure of the braid in a torque transmission part, exfoliation, omission of an end tube, is quality, and is providing a new super-narrow diameter catheter excellent in reliability, and a manufacturing method for the same.

[0008]

[Means for Solving the Problem]In order to solve an aforementioned problem a catheter tube of this invention, An inside diameter with a torque transmission part provided with a braid which consists of a narrow diameter metal wire between a inner layer tube and an outer layer tube which consist of an ultraviolet-curing-resin constituent or ultraviolet rays, and a thermosetting resin composition with the above-mentioned inner layer tube and an equal diameter. And an end tube which consists of an ultraviolet-curing-resin constituent or ultraviolet rays, and a heat-curing resin composition which do not have the above-mentioned braid. A manufacturing method for coming to connect with an ultraviolet-curing-resin constituent on the same axle, and obtaining such a catheter tube and, Apply further liquefied ultraviolet rays and a thermosetting resin composition, or an ultraviolet-curing-resin constituent above on line objects, such as a metal wire, UV irradiation or after making it heat and harden, give this a braid which becomes this periphery from a narrow diameter metal wire, and. After carrying out spreading hardening of the ultraviolet-curing-resin constituent liquefied around this braid above further and forming a torque transmission part, Remove a hardening resin constituent and a braid of a tip part of this torque transmission part, and a line object is exposed, After inserting a flexible end tube object which consists of ultraviolet rays and a thermosetting resin composition, or an ultraviolet-curing-resin constituent in this exposed line object and connecting these torque transmission part and an end tube object with an ultraviolet-curing-resin constituent after that, The above-mentioned line object is sampled.

[0009]Since this invention formed a torque transmission part from a liquefied ultraviolet-curing-resin constituent or ultraviolet rays, and a heat-curing resin composition as mentioned above, and ultraviolet rays or heat is used together and it was made to stiffen this, in order that material may go into a braid eye easily, Exfoliation with a inner layer tube in a braid eye and an outer layer tube stops arising. Therefore, inconvenience, such as exposure of a braid by embedding a braid in a inner layer tube and exfoliation at the time of providing a glue line, is lost like before, and thinning can also be attained easily.

[0010]Remove a hardening resin constituent and a braid of a tip part of a torque transmission part, and a line object is exposed, A flexible end tube which consists of ultraviolet rays and a thermosetting resin composition, or an ultraviolet-curing-resin constituent is inserted in this exposed line object, Then, since the above-mentioned line object was sampled after connecting these torque transmission part and an end tube with an ultraviolet-curing-resin constituent, it is good, without an inside diameter of a terminal area of an end tube and a torque transmission part changing, or heights occurring, and firm connection is attained.

[0011]As shown in Claim 3 or 7, by putting a contrast medium in this resin composition, in the time of actual use, recognition of a catheter by X-rays etc. becomes easy, and operativity improves. The resin composition used in this case needs to use a resin composition hardened not only with UV irradiation but with heat. That is, it is because it is necessary to use heat together with ultraviolet rays in order to perform sufficient hardening from hardening only by ultraviolet rays becoming insufficient, if a contrast medium is added in a resin composition.

[0012]If a heat-curing silicone layer is beforehand provided in the surface of a line object and a

heat-curing silicone layer is beforehand formed in an inner surface of the above-mentioned inner layer tube and an end tube as shown in Claim 4 or 8, activity grant of a tube inner surface will be attained, and the drawing-out nature of a line object improves greatly.
[0013]Since this invention applied a liquefied resin composition on a line object, as shown in Claim 9, it can obtain a catheter tube of desired shape easily by using sectional shape of a line object as a round shape, an ellipse form, a glasses form, etc.
[0014]
[Embodiment of the Invention]Next, an embodiment of the invention is described.
[0015]The ultraviolet-curing-resin constituent used for this invention consists of photopolymerization nature oligomer, a photopolymerization nature monomer, a photopolymerization initiator, etc. fundamentally. With among these, photopolymerization nature oligomer (prepolymer). For example, an epoxy acrylate system, an epoxidized oil acrylate system, a urethane acrylate system, A polyester urethane acrylate system, a polyether urethane acrylate system, A polyester-acrylates system, a polyether acrylate system, a vinyl acrylate system, A silicone acrylate system, a polybutadiene acrylate system, a polystyrene ethyl methacrylate system, It is various oligomer, such as a polycarbonate dicarbo NETO system, an unsaturation polyester system, polyene / thiol system, and has the functional group which has an unsaturated double bond, for example, an acrylyl group, a methacryloyl group, an allyl group, and two or more vinyl groups. Fluoride substitution could be carried out and this photopolymerization nature oligomer may combine two or more sorts of cage NOGOMA. With a photopolymerization nature monomer, one piece or the publicly known compound which it has two or more pieces can be used for functional groups, such as an acrylyl group, a methacryloyl group, a vinyl group, and an allyl group, into a molecule. A photopolymerization initiator has the work which makes the polymerization reaction of photopolymerization nature oligomer or a monomer start, and has a role which receives ultraviolet rays and generates a free radical. For ultraviolet-rays bridge construction, this free radical is required, and a photoinitiator is a substance which will absorb a specified wavelength by UV irradiation, will be in an electric excitation state, and is easy to generate a radical. For example, there are a benzoin ether system, a ketal system, an acetophenone series, a benzophenone series, a thioxan ton system, etc., and various photopolymerization initiators can be used according to the purpose.
[0016]On the other hand, a thermal polymerization start catalyst is further added to the ultraviolet-curing-resin constituent which turns into ultraviolet rays and a heat-curing resin composition from the above-mentioned photopolymerization nature oligomer, a photopolymerization nature monomer, a photopolymerization initiator, etc. And what is necessary is for heat to decompose easily, to generate a free radical as this thermal polymerization start catalyst, and just to perform a hardening reaction. For example, the ketone peroxides which are organic peroxide, peroxy ketals, hydroperoxide, dialkyl peroxide, diacyl peroxide, par oxyl ester species, par oxyl carbonate, and peroxy mono- carbonate are mentioned. There are radical polymerization initiators, such as an azo compound, etc.
[0017]In this invention, using a liquefied ultraviolet-curing-resin constituent or ultraviolet rays, and a heat-curing resin composition, As mentioned above, by supposing that it is liquefied, the thinning of a tube is easy and it is because material goes into a braid eye easily and it is not necessary to embed a braid in a inner layer tube, or to provide a glue line.
[0018]It can protect by compensating the fall of the hardenability due to the fall of an ultraviolet-rays penetration with a contrast medium at the hardening reaction by heat in addition. As this contrast medium, although barium sulfate, bismuth oxide, tungsten carbide, etc. are mentioned, in particular by this invention, it is not limited to these.
[0019]Although it does not limit in particular for the construction material of the line object used for this invention, what consists of corrosion-resistant metal, such as SUS, is preferred.
[0020]Heat-curing silicone is provided in a line body surface after the coating by the resin composition mentioned above in order to improve drawing-out nature of a line object. Activity grant becomes easy by providing a silicone layer in a tube inner surface. Although it does not limit in particular for this heat-curing silicone, the thing excellent in detachability and surface activity with a line object is good desirably. And when the line object excellent in such

detachability and surface activity is used, formation of a heat-curing silicone layer may be omitted.

[0021]

[Example]Next, concrete working example of this invention is described.

[0022](Working example 1) As shown in drawing 2 (B), on the annealed copper wire (line object) 1 with an outer diameter of 2.0 mm, carry out covering hardening of the heat-curing silicone (SR2410: made by Dow Corning Toray Silicone) at 5**1 micrometer in thickness, form the heat-curing silicone layer 2, and on it, After applying a liquefied urethane acrylate system ultraviolet-curing-resin constituent (shore hardness D80), it was made to harden through a UV irradiation furnace, and the 20**2-micrometer-thick inner layer tube 3 was formed. Next, it is a braid (the element wire diameter of 0.035 mm) to the periphery of this inner layer tube 3 by a braider. Give SUS3044 and a liquefied urethane acrylate system ultraviolet-curing-resin constituent (shore hardness D80) is further applied to the periphery of this braid 4. After having stiffened this through the UV irradiation furnace, forming the outer layer tube 5 and forming the torque transmission part 6 with an outer diameter of 2.2 mm, this was cut to 2.5 m, covering of the piece terminal was removed 5 mm, and the annealed copper wire 1 was exposed. Next, as shown in drawing 2 (A), using the metal wire 1 with an outer diameter of 2.0 mm, covering hardening of the urethane acrylate system ultraviolet-curing-resin constituent (shore hardness D70) was carried out at the same process, covered wire with an outer diameter [without a braid] of 2.15 mm was produced, and the 0.1-m end tube 7 which extracted the metal wire 1 was produced. Next, this end tube 7 is inserted in the portion which the annealed copper wire 1 of the torque transmission part 6 exposed 4 mm, Set to the mold 8 as shown in drawing 1, and a urethane acrylate system ultraviolet-curing-resin constituent (shore hardness D80) is poured in from the resin injection part 9 formed in the mold 8, After making this irradiate with and harden ultraviolet rays and connecting both, the metal wire 1 of the torque transmission part 6 was drawn out, and the catheter tube was obtained.

[0023]And as a result of investigating exfoliation by four copies of braids of the torque transmission part 6 by twisting and crookedness, exfoliation of the inner layer tube 3 and the outer layer tube 5 did not produce at all five catheter tubes produced in this way, but both were joined in one. Even if it performed 50 crookedness of a tip terminal area of 40R, lack of the end tube 7, a crack, etc. were hardly generated. There is no influence by the braid 4 also about appearance, and what has a smooth and flat-tapped inner surface was obtained.

[0024](Working example 2) As shown in drawing 3 (B), on the annealed copper wire (line object) 1 with an outer diameter of 2.0 mm, carried out covering hardening of the heat-curing silicone (SR2410: made by Dow Corning Toray Silicone) at 5**1 micrometer in thickness, and formed the heat-curing silicone layer 2, and also. After applying the liquefied urethane acrylate system ultraviolet curing and heat-curing resin composition (shore hardness D80) which 25 % of the weight of bismuth oxide of the contrast medium added, After stiffening this through a UV irradiation furnace and a heating furnace and obtaining the 20**2-micrometer-thick inner layer tube 3a, It is a braid (the element wire diameter of 0.035 mm) to the periphery of the inner layer tube 3a by a braider. Give SUS3044 and a liquefied urethane acrylate system ultraviolet-curing-resin constituent (with the shore hardness D80 and no contrast medium) is further applied to the periphery, After stiffening this through the UV irradiation furnace similarly and forming the outer layer tube 5a with an outer diameter of 2.2 mm, this was cut to 2.5 m and the torque transmission part 6a which removed covering of the piece terminal 5 mm was produced. Next, as shown in drawing 3 (A), the metal wire 1 with an outer diameter of 2.0 mm is used, Covering hardening of the urethane acrylate system ultraviolet-curing-resin constituent (shore hardness D70) which 25 % of the weight of bismuth oxide of the contrast medium added at the same process was carried out, covered wire with an outer diameter [without a braid] of 2.15 mm was produced, and the 0.1-m end tube 7a which extracted the metal wire 1 was produced. And this end tube 7a is inserted in the exposed portion of the annealed copper wire 1 of the torque transmission part 6a 4 mm, It set to the mold shown in drawing 1, and the urethane acrylate system ultraviolet-curing-resin constituent (with the shore hardness D80 and no contrast medium) was poured in, after irradiating with and stiffening ultraviolet rays, the metal wire 1 of

the torque transmission part 6a was removed, and the catheter tube was obtained.
[0025]And when exfoliation was investigated by twisting and crookedness, exfoliation did not produce at all five catheter tubes which were carried out in this way and produced like working example 1, and lack, a crack, etc. were not generated in 50 crookedness of a tip terminal area of 40R. There is no influence by a braid also about appearance, and the smooth surface thing was obtained.
[0026](Comparative example 1) After extruding thermoplastic polyurethane (PERESEN 2363-55D: Dow Chemical Japan, Inc.) 30**5 micrometers in thickness and covering it on annealed copper wire with an outer diameter of 2.0 mm, The braid (the element wire diameter of 0.035 mm, SUS304) was given to the periphery with the braider, thermoplastic polyurethane was further covered on the periphery, and it was considered as the outer diameter of 2.2 mm. This was cut to 2.5 m, the metal wire was extracted, and the torque transmission part was produced. Next, the thing without the metal braids which extruded and covered thermoplastic polyurethane to annealed copper wire with an outer diameter of 2.0 mm, and were made into the outer diameter of 2.2 mm was produced, and the 0.1-m end tube which extracted the metal wire was produced. This was connected to one end of a previous torque transmission part by thermal melting arrival, and the catheter tube was obtained.
[0027]And when exfoliation in the braided layer part of a torque transmission part was investigated for five produced catheter tubes by twisting and crookedness, whenever it repeated twisting and crookedness, exfoliation advanced. In 50 crookedness of a tip terminal area of 40R, although lack was not produced, it is easy to produce a crack. Unevenness of the braid arose in the appearance with a braid part of the torque transmission part.
[0028](Comparative example 2) After extruding thermoplastic polyurethane 30**5 micrometers in thickness and covering it on outer diameter the annealed copper wire of 2.0 mm, give a braid (the element wire diameter of 0.035 mm, SUS304) with a braider to a periphery, and it lets the metallic mold dice which heated this pass, After making a braid eat into a inner layer, thermoplastic polyurethane was further extruded and covered on the periphery, and it was considered as the outer diameter of 2.2 mm. This was cut to 2.5 m, the metal wire was extracted, and the torque transmission part was produced. Next, the thing without the metal braids which extruded and covered thermoplastic polyurethane to annealed copper wire with an outer diameter of 2.0 mm, and were made into the outer diameter of 2.2 mm was produced, and the 0.1-m end tube which extracted the metal wire was produced. This was connected to one end of a previous torque transmission part by thermal melting arrival, and the catheter tube was obtained.
[0029]Although it was not about one comparative example, when exfoliation in the braided layer part of a torque transmission part was investigated for five produced catheter tubes by twisting and crookedness, and twisting and crookedness were repeated, exfoliation occurred. In 50 crookedness of a tip terminal area of 40R, although lack was not produced, it is easy to produce a crack. Since the braid was made to eat into a inner layer, the braid was selectively exposed in the tube and the crack arose in the exposed part by crookedness.
[0030](Comparative example 3) After extruding the thermoplastic polyurethane (PERESEN 2363-55D: Dow Chemical Japan, Inc.) which 25 % of the weight of bismuth oxide of the contrast medium added 30**5 micrometers in thickness and covering it on annealed copper wire with an outer diameter of 2.0 mm, The braid (the element wire diameter of 0.035 mm, SUS304) was given to the periphery with the braider, thermoplastic polyurethane was further covered on the periphery, and it was considered as the outer diameter of 2.2 mm. This was cut to 2.5 m, the metal wire was extracted, and the torque transmission part was produced. Next, the thing without the metal braids which extruded and covered the thermoplastic polyurethane which 25 % of the weight of bismuth oxide of the contrast medium added to annealed copper wire with an outer diameter of 2.0 mm, and were made into the outer diameter of 2.2 mm was produced, and the 0.1-m end tube which extracted the metal wire was produced. This was connected to one end of a previous torque transmission part by thermal melting arrival, and the catheter tube was obtained.
[0031]And when exfoliation in the braided layer part of a torque transmission part was

investigated for five produced catheter tubes by twisting and crookedness, whenever it repeated twisting and crookedness, exfoliation advanced. In 50 crookedness of a tip terminal area of 40R, although lack was not produced, it is easy to produce a crack. Unevenness of the braid arose in the appearance with a braid part of the torque transmission part.

[0032](Comparative example 4) After extruding the thermoplastic polyurethane which 25 % of the weight of bismuth oxide of the contrast medium added 30**5 micrometers in thickness and covering it on outer diameter the annealed copper wire of 2.0 mm, After having given the braid (the element wire diameter of 0.035 mm, SUS304) with the braider to the periphery, letting the metallic mold dice which heated this pass and making a braid eat into a inner layer, thermoplastic polyurethane (with no contrast medium) was further extruded and covered on the periphery, and it was considered as the outer diameter of 2.2 mm. This was cut to 2.5 m, the metal wire was extracted, and the torque transmission part was produced. Next, the thing without the metal braids which extruded and covered thermoplastic polyurethane to annealed copper wire with an outer diameter of 2.0 mm, and were made into the outer diameter of 2.2 mm was produced, and the 0.1-m end tube which extracted the metal wire was produced. This was connected to one end of a previous torque transmission part by thermal melting arrival, and the catheter tube was obtained.

[0033]And although it was not about one comparative example, when exfoliation in the braided layer part of a torque transmission part was investigated for five produced catheter tubes by twisting and crookedness, and twisting and crookedness were repeated, exfoliation occurred. In 50 crookedness of a tip terminal area of 40R, although lack was not produced, it is easy to produce a crack. Since the braid was made to eat into a inner layer, the braid was selectively exposed in the tube and the crack arose in the exposed part by crookedness.

[0034]

[Effect of the Invention]In short, it used having used liquefied ultraviolet rays or a heat-curing resin composition by this invention above.

That from which exfoliation does not produce not making a braid embed like before at a glue line or a inner layer by that cause, either in a braided layer is obtained easily.

From having connected the end tube and the torque transmission part using a metal wire, ultraviolet curing resin, and a mold, it is firm and good connection without inside diameter change or heights is made. Therefore, the outstanding effect that anxious quality super-narrow diameter catheter tubes which are not, such as exfoliation by a torque transmission part, exposure of a braid, and omission of an end tube, can be obtained by being stabilized etc. can be demonstrated.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an explanatory view showing one gestalt of the manufacturing method of this invention.
[Drawing 2](A) is a cross-sectional view showing one gestalt of the end tube of a catheter tube. (B) is a cross-sectional view showing one gestalt of the torque transmission part of a catheter tube.
[Drawing 3](A) is a cross-sectional view showing other gestalten of the end tube of a catheter tube. (B) is a cross-sectional view showing other gestalten of the torque transmission part of a catheter tube.
[Description of Notations]
1 Line object
2 Heat-curing silicone layer
Three (3a) Inner layer tube
4 Braid
5 (5a) outer layer tubes
Six (6a) Torque transmission part
7 (7a) end tubes
8 Mold
9 Resin injection part

[Translation done.]

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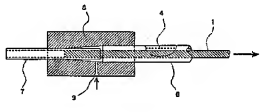
(54)【発明の名称】　カテーテルチューブ及びその製造方法

(57)【要約】

【課題】　本発明の課題はトルク伝達部での編組の露出や剥離、及び先端チューブの脱落等の虞がなく高品質で信頼性に優れた新規な超細径カテーテル及びその製造方法を提供するものである。

【解決手段】　上記課題を解決するために本発明は、紫外線硬化樹脂組成物からなる内層チューブ３と外層チューブ５との間に細径金属線からなる編組４を備えたトルク伝達部６と、内径が上記内層チューブ３と同径で、かつ上記編組４を有しない紫外線硬化樹脂組成物からなる先端チューブ７とを、紫外線硬化樹脂組成物で同軸上に接続する。



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【特許請求の範囲】

【請求項1】　紫外線硬化樹脂組成物からなる内層チューブと外層チューブとの間に金属線からなる編組を備えたトルク伝達部と、内径が上記内層チューブと同径で、かつ上記編組を有しない紫外線硬化樹脂組成物からなる先端チューブと、紫外線硬化樹脂組成物で同軸上に接続してなることを特徴とするカテーテルチューブ。

【請求項2】　紫外線及び熱硬化樹脂組成物からなる内層チューブと外層チューブとの間に金属線からなる編組を備えたトルク伝達部と、内径が上記内層チューブと同径で、かつ上記編組を有しない紫外線及び熱硬化樹脂組成物からなる先端チューブとを、紫外線硬化樹脂組成物で同軸上に接続してなることを特徴とするカテーテルチューブ。

【請求項3】　上記紫外線及び熱硬化樹脂組成物中に造影剤が配合されていることを特徴とする請求項2記載のカテーテルチューブ。

【請求項4】　上記内層チューブ及び先端チューブの内面に、親硬化シリコーン層が形成されていることを特徴とする請求項1又は2記載のカテーテルチューブ。

【請求項5】　請求項1記載のカテーテルチューブの製造方法において、金属線等の線状体上に液状の紫外線硬化樹脂組成物を1層以上塗布し、これに紫外線を照射して硬化させた後、この外周に編径金属線からなる編組を施すと共に、この外周に液状の紫外線硬化樹脂組成物を一層以上塗布し、これに紫外線を照射して硬化させて内層チューブとなし、その後、これらトルク伝達部と先端チューブとを紫外線硬化樹脂組成物で連結した後、上記線状体を抜き取るようにしたことを特徴とするカテーテルチューブの製造方法。

【請求項6】　請求項2記載のカテーテルチューブの製造方法において、金属線等の線状体上に液状の紫外線及び熱硬化樹脂組成物を1層以上塗布し、これに紫外線を照射すると共に、加熱して硬化させた後、この外周に細径金属線からなる編組を施すと共に、この編組の周囲に液状の紫外線硬化樹脂組成物を一層以上塗布し、これに紫外線を照射して硬化させてトルク伝達部を形成した後、このトルク伝達部の先端部の樹脂組成物及び編組を除去して線状体を露出させ、この露出した線状体に紫外線及び熱硬化樹脂組成物からなる可撓性の先端チューブを嵌め込み、その後、これらトルク伝達部と先端チューブとを紫外線硬化樹脂組成物で接続した後、上記線状体を抜き取るようにしたことを特徴とするカテーテルチューブの製造方法。

【請求項7】　上記紫外線及び熱硬化樹脂組成物中に予め造影剤を配合したことを特徴とする請求項6記載のカテーテルチューブの製造方法。

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【請求項8】　上記線状体の表面に予め熱硬化シリコーン層を設けるようにしたことを特徴とする請求項5～7のいずれかに記載のカテーテルチューブの製造方法。

【請求項9】　上記線状体の断面形状が真円形、楕円形、眼鏡形のいずれであることを特徴とする請求項5～8のいずれかに記載のカテーテルチューブの製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は病院などの医療機関で用いられているカテーテルチューブ及びその製造方法に関するものである。

【０００２】

【従来の技術】病院等の医療機関においては患者の生体内の所定部位に外部から薬液や造影剤を注入したり、生体内の体液等を排出するためにカテーテルと称される可撓性を有するチューブ状の医療器具が用いられているが、一般に、このカテーテルは細い血管や尿道等を利用して生体内に挿入されるようにすることから、特に挿入時において、途中の血管壁や生体器官等を傷つけることなく正確に生体内の所定の箇所まで到達できるような高い操作性と安全性が要求されている。

【０００３】そのため、このカテーテルは、血管、生体器官を傷つけずに曲げやすく弾力性に富んだ先端部と、この先端部を所定の箇所まで確実に到達させるためのトルク伝達性を保持したトルク伝達部とから構成されている。そして、その従来の製造方法としては、例えば、先ず丸線を挿入した可塑性プラスチックからなるチューブ体（内層）の外周に配套性の金属線からなる編組を編組機で施した後、引き続き、このチューブ体を加熱した金型に通過させてその編組をチューブ体内に溜め込ませてその周囲に補強層を設けたトルク伝達部を形成する。次に、このトルク伝達部の先端部分に位置する補強層、すなわち金属編組を電気化学的金属除去法により除去して弾力性に富んだ先端部を形成した後、この補強層を覆うようにそのチューブ体の外周に同じく可塑性プラスチックを押出しにより外層を一括被覆してトルク伝達部と先端部とを交互に形成したベースカテーテルを一つのトルク伝達部と先端部とからなる実際のカテーテルの長さとなるように切断すると共に、上記丸線を延伸後、チューブ体から引き抜くことにより形成する方法が知られている。

【０００４】

【発明が解決しようとする課題】ところで、上述したような従来のカテーテル製造方法では、その外径を極力小さく、かつ内径を大きく取るために、カテーテルチューブの厚さを薄くしたりすると、内層チューブに埋め込まれた金属編組がチューブ内側に露出してきたり、チューブ内面に凹凸が生じたりする問題がある。

【０００５】また、均一なトルク伝達性を得るべく内層

と外層とを密着させるには、その間に接着層を設ける場合があるが、そうすると、肉厚が厚くなったり、加工工程が増えてしまうなどの問題がある。

【０００６】さらに、上述したようにその先端部は編組（補強層）を持たない構造とするため、先端部の編組を電気化学的に除去したり、あるいは、編組が組み込まれていない別のチューブ体をトルク伝達部の先端に溶融接続や接着剤などによりに接続したりしているが、編組を除去するためにはそのための装置や工程が必要となって製造効率が悪く、また、溶融接着による方法ではそれらの接続部で内径や外径が変化してしまったりする不都合がある。さらに、接着剤による接続では、接着面積が小さいことから、安定した強度を得にくく、手術中に接着した先端部が生体内に欠落してしまう等の心配が考えられる。特に、異種可塑性プラスチック同士の接続においては、このような欠落の心配のないカテーテルを安定して製造することは極めて困難である。

【０００７】そこで、本発明はこのような課題を有効に解決するために案出されたものであり、その目的はトルク伝達部での編組の露出や剥離、及び先端チューブの脱落等の虞がなく高品質で信頼性に優れた新規な屈曲強力カテーテル及びその製造方法を提供するものである。

【０００８】

【課題を解決するための手段】上記課題を解決するために本発明のカテーテルチューブは、紫外線硬化樹脂組成物又は紫外線及び熱硬化性樹脂組成物からなる内層チューブと外層チューブとの間に細径金属線からなる編組を備えたトルク伝達部と、内径が上記内層チューブと同径で、かつ上記編組を有しない紫外線硬化樹脂組成物または紫外線及び熱硬化樹脂組成物からなる先端チューブとを、紫外線硬化樹脂組成物で周縁上に接続してなるものであり、また、このようなカテーテルチューブを得るための製造方法は、金属線等の線状体上に液状の紫外線及び熱硬化性樹脂組成物又は紫外線硬化樹脂組成物を一層以上塗布し、これに紫外線照射または加熱して硬化させた後、この外周に編径金属線からなる編組を施すと共に、この編組の周囲に液状の紫外線硬化樹脂組成物を一層以上塗布硬化させてトルク伝達部を形成した後、このトルク伝達部の先端部の硬化樹脂組成物及び編組を除去して線状体を露出させ、この露出した線状体に紫外線及び熱硬化性樹脂組成物又は紫外線硬化樹脂組成物からなる可撓性の先端チューブを嵌め込み、その後、これらトルク伝達部と先端チューブ体とを紫外線硬化樹脂組成物で接続した後、上記線状体を抜き取るようにしたことから、編組巨に材料が入りやすくなるため、編組目までの内層チューブと外層チューブとの剥離が生じなくなる。従って、従来のように、内層チューブに編組を埋め込むことによる編組の露出や、接着層を設けた際の剥離等の不都合が無くなり、また、薄肉化も容易に達成できる。

【００１０】また、トルク伝達部の先端部の硬化樹脂組成物及び編組を除去して線状体を露出させ、この露出した線状体に紫外線及び熱硬化性樹脂組成物又は紫外線硬化樹脂組成物からなる可撓性の先端チューブを嵌め込み、その後、これらトルク伝達部と先端チューブとを紫外線硬化樹脂組成物で接続した後、上記線状体を抜き取るようにしたことから、先端チューブとトルク伝達部との接続部の内径が変化しても、凸部が発生することなく良好で、強固な接続が達成される。

【００１１】また、請求項３や７に示すように、この樹脂組成物中に造影剤を入れることにより、実際の使用時において、Ｘ線等によるカテーテルの認識が容易となり、操作性が向上する。尚、この場合、使用する樹脂組成物は紫外線硬化だけでなく、熱によっても硬化する樹脂組成物を用いる必要がある。すなわち、樹脂組成物中に造影剤を添加すると、紫外線のみでの硬化が不十分となることから、充分な硬化を行うためには、紫外線と共に熱を併用する必要があるからである。

【００１２】また、請求項４や８に示すように、線状体の表面に予め熱硬化シリコーン層を設け、上記内層チューブ及び先端チューブの内面に予め熱硬化シリコーン層を形成するようにしておけば、チューブ内面の潤滑性が大幅に達成されると共に、線状体の引抜き性が大きく向上する。

【００１３】また、さらに、本発明は液状の樹脂組成物を線状体上に塗布するようにしたことから、請求項９に示すように、線状体の断面形状を真円形、楕円形、眼鏡形等にすることにより、所望形状のカテーテルチューブを容易に得ることができる。

【００１４】

【発明の実施の形態】次に、本発明の実施の形態を説明する。

【００１５】本発明に使用する紫外線硬化樹脂組成物は、基本的に光重合性オリゴマ、光重合性モノマ、光重合開始剤などからなる。このうち、光重合性オリゴマ（プレポリマ）とは、例えば、エポキシアクリレート系、エポキシ化油アクリレート系、ウレタンアクリレート系、ポリエステルウレタンアクリレート系、ポリエーテルウレタンアクリレート系、ポリエステルアクリレート系、ポリエーテルアクリレート系、ビニルアクリレート系、シリコーンアクリレート系、ポリブタジエンアクリレート系、ポリスチレンエチルメタクリレート系、ポリカーボネートジカルボネート系、不飽和ポリエステル系、ポリエン／チオール系など各種オリゴマであって、不飽和二重結合を有する官能基、例えば、アクリロイル基、メタクリロイル基、アリル基、ビニル基を２個以上

有するものである。また、この光重合性オリゴマはフッ素置換されたものでも良く、２種以上のオリノゴマを混ぜ合わせても良い。また、光重合性モノマとは、分子中にアクリロイル基、メタクリロイル基、ビニル基、アリル基などの官能基を１個又は２個以上有する公知の化合物を用いることができる。さらに、光重合開始剤とは、光重合性オリゴマやモノマの重合反応を開始させる働きを持つもので、紫外線を受けてフリーラジカルを生成する役割を持つ。紫外線装機のためにはこのフリーラジカルが必要で光開始剤は紫外線照射により特定波長を吸収して電気的励起状態となり、ラジカルを発生しやすい物質である。例えば、ベンゾインエーテル系、ケタール系、アセトフェノン系、ベンゾフェノン系、チオキサントン系などがあり、目的に応じて種々の光重合開始剤を用いることができる。

【００１６】一方、紫外線及び熱硬化樹脂組成物とは、上記光重合性オリゴマ、光重合性モノマ、光重合開始剤等からなる紫外線硬化樹脂組成物に、さらに熱重合開始触媒等を添加したものである。そして、この熱重合開始触媒としては、熱により容易に分解し、フリーラジカルを発生し硬化反応を行うものなどであればよい。例えば、有機過酸化物であるケトンパーオキサイド類、パーオキシケタール類、ハイドロパーオキサイド類、ジアルキルパーオキサイド類、ジアシルパーオキサイド類、パーオキシルエステル類、パーオキシジカルボネート類、パーオキシモノカーボネート類等が挙げられる。また、アゾ化合物等のラジカル重合開始剤等がある。

【００１７】本発明において、液状の紫外線硬化樹脂組成物又は紫外線及び熱硬化樹脂組成物を用いるのは、上述したように、被状とすることにより、チューブの薄肉化が容易でかつ、繊細且に材料が入りやすくなって、内層チューブに編組を埋め込んだり、接着層を設ける必要がないためである。

【００１８】造影剤を添加において紫外線透過の低下による硬化性の低下を、熱による硬化反応で補うようにすることにより防ぐことができる。この造影剤としては、硫酸バリウム、酸化ビスマス、タングステンカーバイトなどが挙げられるが、本発明では特にこれらに限定されるものではない。

【００１９】本発明に使用する線状体の材質について は、特に限定するものではないが、ＳＵＳ等の耐食性の金属からなるものが好ましい。

【００２０】また、線状体表面に熱硬化シリコーンを設けるのは、上述した被造組成物による被覆加工後、線状体の引抜性を良くするためである。さらに、チューブ内面にシリコーン層を設けることで、活性付与が容易となる。尚、この熱硬化シリコーンについては、特に限定するものではないが、望ましくは、線状体との剥離性や表面活性に優れたものが良い。そして、このような剥離性や表面活性に優れた線状体を用いた場合には熱硬化シリコーン層の形成を省略しても良い。

【００２１】

【実施例】次に、本発明の具体的実施例を説明する。

【００２２】（実施例１）図２（Ｂ）に示すように、外径２．０mmの軟銅線（線状体）Ｉ上に熱硬化シリコーン（ＳＲ２４１０：東レ・ダウコーニング・シリコーン（株）製）を厚さ５±１μmに被覆硬化して熱硬化シリコーン層２を形成し、その上に、液状のウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ８０）を塗布した後、紫外線照射炉を通して硬化させ、厚さ２０±２μmの内層チューブ３を形成した。次に、編組機により、この内層チューブ３の外周に編組（素線径０．０３５mm、ＳＵＳ３０４）４を施し、さらにこの編組４の外周に液状のウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ８０）を塗布し、紫外線照射炉を通してこれを硬化させて外層チューブ５を形成し、外径２．２mmのトルク伝達部６を形成した後、これを２．５mに切断し、その片端末の被覆を５mm除芯して軟銅線１を露出した。次に、図２（Ａ）に示すように、外径２．０mmの金属線１の用い、同様な工程でウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ７０）を被覆硬化させ、編組のない外径２．１５mmの被覆線を作製し、金属線Ｉを抜いた０．１mの先端チューブ７を作製した。次に、この先端チューブ７をトルク伝達部６の軟銅線１の露出した部分に４mm挿入し、図１に示すような型８にセットし、その型８に形成された樹脂注入部９からウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ８０）を注入し、これに紫外線を照射して硬化させて両者を接続した後、トルク伝達部６の金属線１を引き抜いてカテーテルチューブを得た。

【００２３】そして、このようにて作製したカテーテルチューブ５本を鋲固及び屈曲によりトルク伝達部６の編組４部での剥離を調べた結果、内層チューブ３と外層チューブ５の剥離は全く生じず、両者は一体的に接合されていた。また、先端接続部の４０Ｒの屈曲５０回を行っても、先端チューブ７の欠落及び割れ等は殆ど発生しなかった。さらに、外観についても編組４による影響はなく、内面が平滑で面一なものが得られた。

【００２４】（実施例２）図３（Ｂ）に示すように、外径２．０mmの軟銅線（線状体）Ｉ上に熱硬化シリコーン（ＳＲ２４１０：東レ・ダウコーニング・シリコーン（株）製）を厚さ５±１μmに被覆硬化して熱硬化シリコーン層２を形成した上に、造影剤の酸化ビスマス２５重量％添加した液状のウレタンアクリレート系紫外線硬化兼熱硬化樹脂組成物（ショア硬度Ｄ８０）を塗布した後、これを紫外線照射炉及び加熱炉を通して硬化させ、厚さ２０±２μmの内層チューブ３ａを得た後、編組機によりその内層チューブ３ａの外周に編組（素線径０．０３５mm、ＳＵＳ３０４）４を施し、さらにその外周に液状のウレタンアクリレート系紫外線硬化樹脂組成物

（ショア硬度Ｄ８０、造影剤無し）を塗布し、これを同様に紫外線照射炉を通して硬化させて外径２．２ｍｍの外層チューブ５ａを形成した後、これを２．５ｍに切断し、片端末の被覆を５ｍｍ除去したトルク伝達部６ａを作製した。次に、図３（Ａ）に示すように、外径２．０ｍｍの金属線１を用い、同様な工程で造影剤の酸化ビスマス２５重量％添加したウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ７０）を被覆硬化させ、繊細のない外径２．１５ｍｍの被覆線を作製し、金属線１を抜いた０．１ｍの先端チューブ７ａを作製した。そして、この先端チューブ７ａをトルク伝達部６ａの軟質線１の露出部分に４ｍｍ挿入し、図１に示す型にセットし、ウレタンアクリレート系紫外線硬化樹脂組成物（ショア硬度Ｄ８０、造影剤無し）を注入し、紫外線を照射して硬化させた後、トルク伝達部６ａの金属線１を除去してカテーテルチューブを得た。

【００２５】そして、このようにして作製したカテーテルチューブ５本を撚回及び屈曲により剥離を調べたところ、実施例１と同様に、剥離は全く生じなく、また、先端接続部の４０Ｒの屈曲５０回において、欠落及び割れ等は発生しなかった。さらに、外観についても繊組による影響はなく、平滑な表面なものが得られた。

【００２６】（比較例１）外径２．０ｍｍの軟鋼線上に熱可塑性ポリウレタン樹脂（ペレセン２３６３－５５Ｄ：ダウ・ケミカル日本（株））を厚さ３０±５μｍ押出し被覆した後、繊組機により外周に繊組（素線径０．０３５ｍｍ、ＳＵＳ３０４）を施し、さらに外周に熱可塑性ポリウレタン樹脂を被覆し、外径２．２ｍｍとした。これを２．５ｍに切断し、金属線を抜いてトルク伝達部を作製した。次に外径２．０ｍｍの軟鋼線に熱可塑性ポリウレタン樹脂を押出し被覆し外径２．２ｍｍとした金属繊組のないものを作製し、金属線を抜いた０．１ｍの先端チューブを作製した。これを先のトルク伝達部の片末端に熱融着により接続し、カテーテルチューブを得た。

【００２７】そして、作製したカテーテルチューブ５本を撚回及び屈曲によりトルク伝達部の繊組層部での剥離を調べたところ、撚回や屈曲を繰り返す毎に剥離が進行した。また、先端接続部の４０Ｒの屈曲５０回において、欠落は生じなかったが、割れが生じやすいものであった。さらに、繊組部を持つトルク伝達部の外観には繊組の凹凸が生じた。

【００２８】（比較例２）外径２．０ｍｍ軟鋼線上に熱可塑性ポリウレタン樹脂を厚さ３０±５μｍ押出し被覆した後、繊組機により外周に繊組（素線径０．０３５ｍｍ、ＳＵＳ３０４）を施し、これを加熱した金型ダイスを通して、繊組を内層に食い込ませた後、さらにその外周に熱可塑性ポリウレタン樹脂を押出し被覆し、外径２．２ｍｍとした。これを２．５ｍに切断し、金属線を抜いてトルク伝達部を作製した。次に、外径２．０ｍｍの軟鋼線に熱可塑性ポリウレタン樹脂を押出し被覆し外径２．２ｍｍとした金属繊組のないものを作製し、金属線を抜いた０．１ｍの先端チューブを作製した。これを先のトルク伝達部の繊組層部での剥離を調べたところ、撚回や屈曲を繰り返すと剥離が進行した。また、先端接続部の４０Ｒの屈曲５０回において、欠落は生じなかったが、割れが生じやすいものであった。さらに、繊組部と持つトルク伝達部の外観には繊組の凹凸が生じた。

【００２９】作製したカテーテルチューブ５本を撚回及び屈曲によりトルク伝達部の繊組層部での剥離を調べたところ、比較例１ほどではないが撚回や屈曲を繰り返すと剥離が発生した。また、先端接続部の４０Ｒの屈曲５０回において、欠落は生じなかったが、割れが生じやすいものであった。さらに、繊組を内層に食い込ませたため、部分的にチューブ内に繊組が露出し、屈曲により、露出部に割れが生じた。

【００３０】（比較例３）外径２．０ｍｍの軟鋼線上に、造影剤の酸化ビスマス２５重量％添加した熱可塑性ポリウレタン樹脂（ペレセン２３６３－５５Ｄ：ダウ・ケミカル日本（株））を厚さ３０±５μｍ押出し被覆した後、編組機により外周に網組（素線径０．０３５ｍｍ、ＳＵＳ３０４）を施し、さらに外周に熱可塑性ポリウレタン樹脂を被覆し、外径２．２ｍｍとした。これを２．５ｍに切断し、金属線を抜いてトルク伝達部を作製した。次に、外径２．０ｍｍの軟鋼線に造影剤の酸化ビスマス２５重量％添加した熱可塑性ポリウレタン樹脂を押出し被覆し外径２．２ｍｍとした金属編組のないものを作製し、金属線を抜いた０．１ｍの先端チューブを作製した。これを先のトルク伝達部の片末端に熱融着により接続し、カテーテルチューブを得た。

【００３１】そして、作製したカテーテルチューブ５本を撚回及び屈曲によりトルク伝達部の編組層部での剥離を調べたところ、撚回や屈曲を繰り返す毎に剥離が進行した。また、先端接続部の４０Ｒの屈曲５０回において、欠落は生じなかったが、割れが生じやすいものであった。さらに、編組部を持つトルク伝達部の外観には編組の凹凸が生じた。

【００３２】（比較例４）外径２．０ｍｍ軟鋼線上に造影剤の酸化ビスマス２５重量％添加した熱可塑性ポリウレタン樹脂を厚さ３０±５μｍ押出し被覆した後、編組機により外周に網組（素線径０．０３５ｍｍ、ＳＵＳ３０４）を施し、これを加熱した金型ダイスを通して、編組を内層に食い込ませた後、さらにその外周に熱可塑性ポリウレタン樹脂（造影剤無し）を押出し被覆し、外径２．２ｍｍとした。これを２．５ｍに切断し、金属線を抜いてトルク伝達部を作製した。次に、外径２．０ｍｍの軟鋼線に熱可塑性ポリウレタン樹脂を押出し被覆し外径２．２ｍｍとした金属編組のないものを作製し、金属線を抜いた０．１ｍの先端チューブを作製した。これを先のトルク伝達部の片末端に熱融着により接続し、カテーテルチューブを得た。

【００３３】そして、作製したカテーテルチューブ５本を撚回及び屈曲によりトルク伝達部の編組層部での剥離

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を調べたところ、比較例1ほどではないが蛇行や屈曲を繰り返すと剥離が発生した。また、先端接続部の40Rの屈曲50回において、欠落は生じなかったが、割れが生じやすいものであった。さらに、編組を内層に食い込ませたため、部分的にチューブ内に編組が露出し、屈曲により、露出部に割れが生じた。

【0034】

【発明の効果】以上要するに本発明によれば、波状の紫外線又は熱硬化樹脂組成物を用いるようにしたことから、従来のように接着層や内層に編組を埋め込まずとも編組層で剥離が生じないものが容易に得られる。また、金属線と紫外線硬化樹脂及び型を用いて先端チューブとトルク伝達部とを接続するようにしたことから、強固で内径変化や凸部の無い良好な接続が行われる。従って、トルク伝達部での剥離や編組の露出、先端チューブの脱落などの心配のない高品質の超細径カテーテルチューブを安定して得ることができる等といった優れた効果を発揮することができる。

【図面の簡単な説明】

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【図1】本発明の製造方法の一形態を示す説明図である。

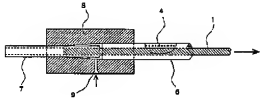
【図2】（A）はカテーテルチューブの先端チューブの一形態を示す横断面図である。（B）はカテーテルチューブのトルク伝達部の一形態を示す横断面図である。

【図3】（A）はカテーテルチューブの先端チューブの他の形態を示す横断面図である。（B）はカテーテルチューブのトルク伝達部の他の形態を示す横断面図である。

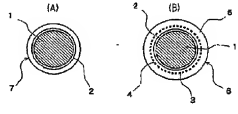
【符号の説明】

1　線状体
2　熱硬化シリコーン層
3（3a）　内層チューブ
4　編組
5（5a）　外層チューブ
6（6a）　トルク伝達部
7（7a）　先端チューブ
8　型
9　樹脂注入部

【図1】



【図2】



【図3】